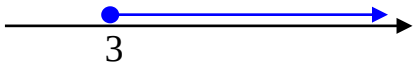
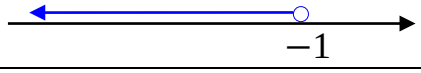
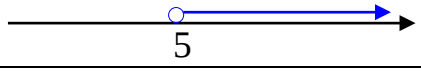
L.4 Linear Inequalities and Interval Notation

linear inequality – any inequality that can be written in one of the following forms:
$Ax + B > 0$, $Ax + B \geq 0$, $Ax + B < 0$, $Ax + B \leq 0$, $Ax + B \neq 0$

Examples: $x > 2$, $2x \geq 6$, $x + 1 < 4$, $\frac{3}{2}x - 3 \leq 0$, $x \neq 1$

To solve an inequality means to find ..... satisfying the inequality. The set of such values is called ..... .

Solution sets can be graphed on a number line and recorded in **interval notation**, as follows:

inequality	graph	set-builder notation	interval notation
$2x \geq 6$		$\{x \mid x \geq 3\}$	$[3, \infty)$
$-x > 1$			$(-\infty, -1)$
			
			$(-\infty, -4]$
$x \geq x$			
		$\{x \mid x \neq 3\}$	

Recall: Solve inequalities the same way as equations, except when **multiplying or dividing by a negative** number, **reverse** the inequality sign.

Example 1: Solve, graph, and state your answer in interval notation.

a) $2(6 - x) < 6x + 1$

b) $\frac{1}{3}(2x + 5) - 6 \geq -\frac{1}{4}(12x - 8)$

Simultaneous Inequalities:

To state that x is between two numbers, say between 2 and 3, we write $\mathbf{2 < x < 3}$.
This really means that $\mathbf{2 < x}$ **and** $\mathbf{x < 3}$.

To solve simultaneous inequalities, apply the needed operations to **all three parts** of the inequality.

Example 2: Solve.

a) $2 \leq 1 - 3x < 5$

b) $-1 < \frac{2x+5}{4} \leq 3$

Example 3: Write appropriate inequality and solve.

a) Double a number increased by 1 is between 2 and 8.

b) If 5 is subtracted from a number, then the result is at least 7.

Example 4: After a serious automobile accident, most insurance companies will replace the damaged car with a new one if repair costs exceed 80% of the "blue-book" value of the car. John's car recently sustained $9200 worth of damage but was not replaced. What can we say about the blue-book value of his car?

Example 5:

Toni can be paid in one of two ways:
Plan A: A salary of $400 per month plus a commission of 8% of gross sales;
Plan B: A salary of $610 per month plus a commission of 5% of gross sales.
For what amount of gross sales should Toni select plan A?